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## The Role of Smartphone Addiction on Bed Procrastination and Mindful Eating Behavior in Adolescents

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**Abstract.** Excessive smartphone use causes the behavior of delaying bedtime and decreasing mindful eating in teenagers. The aim of this research is to find out and explain how much the risk of smartphone addiction plays a role in increasing bed procrastination behavior and decreasing mindful eating in adolescents. There were 192 participants involved in the research with the sampling technique used was convenience sampling. Participant characteristics include teenagers aged 18 – 21 years and have a cut off score for smartphone addiction. Each participant filled out the Smartphone Addiction Scale Short Version for Adolescents, Bedtime Procrastination Scale, and Mindful Eating Questionnaire questionnaires. Data were analyzed using a simple regression method. Based on the results of the regression test, it was found that the risk of smartphone addiction played a 6.1% role in increasing bed procrastination behavior and a 13.3% role in reducing mindful eating behavior. The results of this study also found other factors that play a role in procrastination behavior at bedtime and mindful eating in teenagers besides excessive smartphone use. Therefore, it is hoped that future research will be able to consider and look at other factors besides the risk of smartphone addiction that play a role in bed procrastination and mindful eating.

*Keywords:* adolescents; bed procrastination; mindful eating; smartphone addiction

### INTRODUCTION

Technological advances in this era lighten the burden of most human activities. This condition impacts lifestyle changes, especially healthy lifestyles for teenagers. Behavioral changes easily found in daily life are related to sleeping and eating behavior. Today's teenagers who grow up amidst technological developments tend to sleep less than the recommended sleep duration for their age and display unhealthy eating behavior, such as eating in a hurry, consuming much fast food, and not being aware of the amount of food or calories consumed.

Research studies conducted by Kroese et al. (2016) related to changes in the sleep behavior of teenagers found that modern society, especially teenagers, tends to delay bedtime or bed procrastination with a prevalence of 53.1%. Kroese et al. (2014) defined delayed sleep time or bed procrastination as a behavior characterized by delayed sleep time and sleepless behavior experienced by a person and is not caused by interference from external factors. Kroese et al. (2014) said there are three characteristics of bed procrastination: experiencing insufficient sleep, hours of sleep, and fatigue during the day. Experienced insufficient sleep or the experience of lack of sleep is a characteristic of bed procrastination when individuals feel that they do not have enough or

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maximum sleep time. Hours of sleep include factors related to how much time an individual spends sleeping. Meanwhile, fatigue during the day is related to how often individuals feel tired when doing activities.

Bed procrastination behavior has an influence on reducing adolescents' ability to fulfill physiological needs, one of which is sleep (Grandner, 2017). Sleep plays a vital role in the development of cognitive function in adolescents. It is closely related to increasing cortical activity, oxygen in the body, and the release of epinephrine (Syamsuedin et al., 2015). The Suni and Vyas (2023) explained that the recommended sleep duration or time for teenagers is 8 to 10 hours in 1 day. However, Keyes et al. (2015) found that today's teenagers have experienced a decrease in sleep duration, namely less than 7 hours a day. Meanwhile, teenagers who sleep less than the recommended ideal duration or cannot meet their sleep needs tend to experience health problems related to sleep behavior (Trihono et al., 2013). Not only that, teenagers with a high level of bed procrastination will usually postpone other activities, disrupting daily activities due to drowsiness, laziness, and lack of focus during activities (Kroese et al., 2014).

Apart from impacting changes in sleep behavior or the emergence of bed procrastination, there are also changes in the eating behavior of teenagers who have grown up in the digital era. This change in eating behavior refers to the decline in mindful eating in adolescents. Mindful eating is defined as a technique of paying full attention to eating behavior, which is characterized by not judging all forms of internal and external cues that influence the desire to eat, the type of food chosen, the amount of food consumed, and how to consume food (Hanh & Cheung, 2010). Internal cues in mindful eating behavior relate to signals of hunger and fullness (Kristeller & Wolever, 2010), while external cues relate to how much food is served and the environment in which eating behavior occurs (Wansink, 2004). According to Framson et al. (2009), mindful eating has five dimensions, namely Disinhibition (the ability to realize when individuals have difficulty controlling themselves when eating), Awareness (individuals can be fully aware of the shape, taste, and aroma of food), External cues (the individual can realize that external influences influence his eating behavior), Emotional response (the individual realizes that emotional impulses influence his eating behavior), and Distraction (the individual realizes that there are things that interfere with his eating behavior).

Today's teenagers tend not to show mindful eating behavior but instead display mindless eating behavior. Mindless eating can occur when the behavior or desire to eat is not driven by hunger signals or the need to fulfill nutrition but by external cues such as family, friends, the color of food, the shape of the food, or the amount of food served. Not only that, but activities considered to be a distraction to eating behavior can also trigger mindless eating behavior (Bahl et al., 2013).

This change in behavior or healthy lifestyle is caused, in part, by excessive use of smartphones. In this era of modern developments, followed by the development of digital technology, teenagers are considered the most significant group who use smartphones. This is proven by examples of teenagers' behavior when they spend their free time, namely playing with smartphones. Teenagers use smartphones for online shopping, playing games, watching YouTube, and surfing social media. This statement is in line with the results of research conducted by Andriani et al. (2019) that as many as 51.1% of teenagers in Indonesia use their smartphones for 3 - 5 hours, and another 22.2% use smartphones for a longer duration, namely more than 6 hours in one day. Gökçeşarlan et al. (2016) stated in their research that the duration of smartphone use can influence smartphone addiction behavior risk.

Smartphone addiction is a compulsive or problematic behavior indicated by an individual's

inability to regulate and control smartphone use, as well as an increase in the duration of its use (Lin et al., 2014, 2016). Addiction to smartphones will have an impact on the emergence of health problems such as nerve, ear, eye, and sleep disorders (Mawitjere et al., 2017). Not only that, excessive use of smartphones and leading to risky behavior for smartphone addiction also has an impact on the emergence of bed procrastination (Demirci et al., 2015) and mindless eating behavior (Alosaimi et al., 2016).

A study of adolescents in 8 countries proved that 75% of the participants stated that they always took their smartphone to bed and chose to delay their bedtime at night to use it (Duerson, 2012). The behavior of delaying bedtime (bed procrastination) is caused by the emergence of teenagers' desire to continually use smartphones, such as accessing social media, playing games, etc. It does not stop there. Research conducted in 2019 also showed that as many as 63% of teenage participants slept less than 7 hours a day. This behavior is caused by teenagers' desire to continuously use smartphones, even though it is time to sleep or rest at night (Keswara et al., 2019). Thus, the bed procrastination phenomenon commonly experienced by teenagers is caused by the desire to play on smartphones continuously.

Not only does it impact the emergence of bed procrastination behavior, but excessive smartphone use in teenagers also increases mindless eating behavior. One of the causes of mindless eating behavior is using a smartphone while eating is in progress. Adolescents distracted by smartphone exposure while eating will reduce the quality of mindful eating, which is indicated by an increase in the amount of energy and fat consumed by 15%. In addition, using a smartphone while eating causes individuals to experience decreased focus on ongoing eating activities. Finally, teenagers who continue to use smartphones at mealtimes tend not to pay attention to the amount of food and the type of food they consume (Gonçalves et al., 2019).

Research regarding the risks of smartphone addiction is essential for further investigation, primarily when the addictive behavior is associated with healthy behaviors such as sleeping and eating. Moreover, the number of teenagers using smartphones is increasing, and there has not been much research discussing smartphone use and procrastination behavior at bedtime and mindful eating in teenagers. Meanwhile, the World Health Organization (WHO) (2014) explained that adolescence is a period of individual development from childhood to adulthood and requires maximum nutritional intake to support its development. Individuals in the teenage age range must fulfill their sleep needs through adequate sleep (Jenco, 2016). Adolescents also need appropriate and balanced nutritional intake to help with physical growth and development in other aspects (Hafiza et al., 2020). Previous research by Keswara et al. (2019) found a relationship between smartphone usage behavior and sleep quality in teenagers. The research results show that the decline in sleep quality is caused by teenagers choosing not to go to bed on time and to play on smartphones. Research conducted by Stanszus et al. (2019) proved that using a smartphone while eating can cause weight gain in teenagers due to excessive food consumption. Teenagers who continue to use cell phones while eating can be judged to have smartphone addiction (Stanszus et al., 2019). Decreased focus/concentration due to distraction while eating is in progress is one of the characteristics that they have experienced smartphone addiction (Örnek & Gündoğmuş, 2022).

The explanation of the phenomenon above proves that the risk of smartphone addiction plays a role in the emergence of unhealthy behavior related to sleeping and eating behavior. For this reason, researchers will test two hypotheses as a temporary answer regarding the role of smartphone addiction risk on bed procrastination and mindful eating behavior in adolescents. The hypothesis of this research is formulated as follows: H1: The risk of smartphone addiction has a significant role in increasing bed procrastination behavior in adolescents; H2: The risk of smartphone addiction has a

significant role in decreasing mindful eating behavior in adolescents,

## METHOD

The type of this research is qualitative research. Watson (2015) explained quantitative research as a type of research carried out to analyze a phenomenon using numerical data that is processed statistically. Then, the type of research used is associative to look at the role (Jhangiani et al., 2019) of the risk of smartphone addiction on bed procrastination and mindful eating behavior in adolescents. The research population was late adolescents in Indonesia with the late adolescent age range proposed by Monks et al. (2002), namely 18 – 21 years. Convenience sampling was used for this research, and 192 samples of late adolescents were obtained. All participants expressed their willingness to participate in the research and were willing to fill out the questionnaire given online via Google Forms.

This research uses the Bedtime Procrastination Scale (BPS) measurement tool (Kroese et al., 2014), which experts have translated into Indonesian to measure the bed procrastination variable. The Bedtime Procrastination Scale has nine items with 5 Likert scales as answer choices, namely 1 (never) and 5 (always). The BPS measuring instrument has several unfavorable items: items 2, 3, 7, and 9. The total score obtained from the BPS measuring instrument is 9 – 45; the higher the score, the higher the individual's procrastination during sleep. Furthermore, the reliability testing technique used is Cronbach's Alpha internal consistency method. The results of the reliability test show that the Bedtime Procrastination Scale measuring instrument has a high-reliability value of 0.678 with a confidence level of 95%. One example of an item in the Bedtime Procrastination measuring tool is "I still do other activities when it is time to sleep."

The mindful eating variable was measured using an instrument compiled by Framson et al. (2009), the Mindful Eating Questionnaire, which was translated into Indonesian by experts. The MEQ measuring tool comprises five factors: disinhibition, awareness, external cues, emotional response, and distraction. MEQ consists of 28 items with 4 Likert scales. There are several unfavorable items in the MEQ measuring tool, namely item numbers 3, 4, 5, 6, 7, 8, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, and 28. The higher the average score, the better the mindful eating behavior displayed by the individual. Based on the reliability test using Cronbach's Alpha results, it can be explained that the Mindful Eating Questionnaire measuring instrument has high reliability with a reliability coefficient of 0.737, and the reliability coefficient of each dimension is in the range of 0.625 - 0.755. An example of an item in the Mindful Eating Questionnaire is, "If there is delicious food at an event, I will continue to eat that food even though I am full."

This research uses a measuring instrument belonging to Kwon et al. (2013), the Smartphone Addiction Scale Short Version for Adolescents (SAS-SV), translated into Indonesian, to measure smartphone addiction variables. The SAS-SV for Adolescents comprises ten items with a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). The total score range for the SAS-SV for Adolescents is 10 – 60 points. The higher the total score obtained, the higher the individual's risk of smartphone addiction. Cronbach's Alpha internal consistency is used to test the reliability of the SAS-SV measuring instrument. The reliability test results prove that the SAS-SV measuring instrument has a high-reliability coefficient, namely 0.796. One of the items in the SAS-SV for Adolescents measuring tool is "When using a smartphone, I neglect work that I should have completed."

Furthermore, a simple regression test is the statistical method used to analyze research data. A simple regression test is carried out to analyze data statistically on one independent variable and

one dependent variable to predict the value of the dependent variable ( $Y = \text{Bed Procrastination and Mindful Eating}$ ) based on the value of the independent variable ( $X = \text{Smartphone Addiction}$ ) and carrying out significance testing the role of independent variables in a regression equation (Smadi & Abu-Afouna, 2012). In this study, the simple regression test was carried out twice because this study tested two dependent variables with one independent variable, namely a simple regression test on the variable bed procrastination on smartphone addiction and a simple regression test on the variables mindful eating and smartphone addiction.

## RESULTS AND DISCUSSION

Based on the participant data collection process, 192 late adolescents in Indonesia participated and filled out the questionnaire. Table 1 shows that most participants are women (75%), have more than 4 hours of smartphone usage outside of study, school, and work (95%), and the average age of participants is 19.71 years.

**Table 1.**

Research Demographic Data		
Variable	Total	%
Gender		
Male	48	25%
Female	144	75%
Age (mean= 19,71)	192	100%
Smartphone usage duration outside of study, school, and		
≥ 4 Hours	183	95%
< 4 Hours	9	5%

Furthermore, Table 2 shows that the 192 participants involved in the study were classified as having a high risk of smartphone addiction when viewed based on the cut-off score from the SAS-SV for Adolescents.

**Table 2.**

Categorization of SAS-SV Scores for Adolescents				
Gender	Cut Off Score	Total	Mean	Indication
Male	≥31	48	41.77	High risk of smartphone addiction
Female	≥33	144	41.76	High risk of smartphone addiction

Table 3 shows that all participant data in each measuring instrument is normally distributed ( $p > 0.05$ ).

**Table 3.**

Normality Test Results		
	Absolute	Asymp.Sig. (2-tailed)
SAS-SV with BPS	0.058	0.200
SAS-SV with MEQ	0.056	0.200



The next stage is testing the linearity assumption. Table 4 contains the results of the linearity test using the ANOVA test, proving that all research power is linear ( $p < 0.05$ ).

**Table 4.**

Linearity Test Results

Variable	F	Sig
SAS-SV with BPS	11.419	< 0.001
SAS-SV with MEQ	26.952	< 0.001

Next, table 5 shows the results of the simple regression analysis to test the research hypothesis. Hypothesis testing was carried out because this research met the assumption test.

**Table 5.**

Hypothesis Test Analysis Results

No	Variabel		R <sup>2</sup>	B	p	Significance
	Eksogen	Endogen				
1	Smartphone addiction	Bed procrastination	0.061	0.110	< 0.001	Significant
2	Smartphone addiction	Mindful Eating	0.133	-0.275	< 0.001	Significant

Based on the results of hypothesis testing using regression analysis in Table 5, it is proven that smartphone addiction risk behavior plays a significant role in all endogenous variables measured in this study, namely bed procrastination and mindful eating. The results of the regression analysis show that risk behavior for smartphone addiction plays a positive role in increasing procrastination during sleep. Apart from that, this research also succeeded in proving that smartphone addiction risk behavior plays a negative role in reducing mindful eating behavior. Smartphone addiction risk behavior has a significant role of 6.1% in increasing procrastination behavior during sleep. Second, smartphone addiction risk behavior has a significant role of 13.3% in decreasing mindful eating behavior.

Smartphone addiction behavior is defined as a behavior characterized by compulsive behavior and a person's inability to regulate or control smartphone use, as well as experiencing an increase in the duration of its use (Lin et al., 2014, 2016). One of the problems caused by the risk of smartphone addiction is problems with sleep behavior (Mawitjere et al., 2017). These sleep problems are caused by increased bed procrastination behavior due to individuals experiencing the risk of smartphone addiction (Demirci et al., 2015).

Research conducted by Jarmi and Rahayuningsih (2017) explained further the risk of smartphone addiction in increasing procrastination during sleep. His research explained that teenagers who use smartphones before bed could make the RAS (Reticular et al.) system, which is responsible for regulating sleep in the brain center, active again. The activation of the RAS system results from stimuli emitted by smartphones, such as sound, vibration, and light, making it difficult for teenagers to start sleeping. Lam (2014) stated in his research that teenagers who actively use smartphones excessively are always associated with the emergence of procrastination behavior at bedtime at night when it is time to sleep. This can happen because the risk of smartphone addiction can make teenagers focus more on something that is considered fun for them, namely smartphones. Then, ignoring sleep time to use or play with smartphones (Pandey et al., 2019).

The results of this study are in line with previous findings regarding the impact of the risk of smartphone addiction on the emergence of bed procrastination behavior. Research conducted on 521 students in China revealed that as many as 96.08% of participants had the habit of using

smartphones before going to bed, and 71.90% of them preferred to continue using and playing smartphones after 23.00 at night (Geng et al., 2021). Not only that, in 2019, there was a study that found that 12% of 815 teenage participants chose to continue using smartphones for 3 – 5 hours in the middle of the night rather than using the night time to sleep and rest (Rod et al., 2018). The results of this study further strengthen the results of this study and prove that the risk of smartphone addiction experienced by teenagers plays a role in increasing bed procrastination behavior.

Previous studies have explained that bed procrastination behavior is closely related to smartphone addiction risk behavior. This is supported by research conducted by Kroese et al. (2016) that the risk of smartphone addiction can make individuals experience an unwillingness to stop activities seeking pleasure via their smartphone and have an impact on decreasing motivation to sleep at night. Geng et al. (2021) said something similar that individuals will tend to delay their bedtime for more time to relax and entertain themselves by playing with their smartphones. Not only that, according to the results of research conducted by Chung et al. (2020), teenagers who are in the high bed procrastination category tend to spend more time using smartphones for more than 7 hours a day, including 3 hours before bedtime, even the duration of smartphone use will increase as it approaches bedtime. Sleep. This is in line with the factors that cause the emergence of bed procrastination. Namely, using electronic media such as smartphones can cause individuals to delay their sleep (Gradisar et al., 2013). Thus, it can be concluded that teenagers procrastinate at bedtime due to the desire to use smartphones, which are considered a source of online pleasure.

Furthermore, the risk of smartphone addiction also has a significant role of 13.3% in reducing mindful eating behavior in teenagers. Gonçalves et al. (2019) explained in their research that using a smartphone while eating has an impact on reducing mindful eating and is followed by an increase in the amount of calorie intake into the body by 15%, as well as excessive fat consumption. This happens because teenagers continue to use their smartphones while eating, making it difficult or even impossible to realize how much food they have consumed because they are too focused on their smartphones. They also prefer to skip meals to play on their smartphones or choose to eat fast food, which is more practical. This is what ultimately makes the eating behavior of teenagers addicted to smartphones change to mindless eating (Kartal & Ayhan, 2021). Mindless eating can occur when the behavior or desire to eat is not driven by hunger signals or the need to fulfill nutrition but by external cues such as family, friends, the color of food, the shape of the food, or the amount of food served. Not only that, but activities considered to be a distraction to eating behavior can also trigger mindless eating behavior (Bahl et al., 2013).

Furthermore, disinhibition is associated with each dimension of mindful eating, a condition when an individual realizes he cannot control himself. At the same time, eating activities occur (Framson et al., 2009). The results of this research are research studies conducted by Ogden et al. (2013) and Dohle et al. (2018), which prove that using a smartphone while eating will make it difficult for individuals to realize when they cannot control the food they consume. Also, using smartphones, which has become a lifestyle and habit for teenagers, may affect their ability to remain aware when they have overeaten (Andriani et al., 2019).

The second dimension in mindful eating, namely awareness, can also be linked based on research results, proving that smartphone addiction's risk plays a role in decreasing mindful eating. According to Framson et al. (2009), the awareness dimension relates to how teenagers can give full attention and awareness to their food's shape, taste, texture, and aroma. The results of this study are and can provide new evidence from a study conducted by Moray et al. (2007) and Oldham-Cooper et al. (2011), who stated that using a smartphone while eating can reduce awareness of food, eating situations, and the amount consumed.

Then, the risk of smartphone addiction, which plays a role in reducing mindful eat-

ing, can also be interpreted as being able to reduce the external cues dimension in mindful eating. Several external factors that influence eating behavior are food advertisements, the amount of food served, and environmental conditions during the eating activity (Framson et al., 2009). The results of this research are in line with a study conducted by Slobodan and Sosic (2012) that the increasingly rapid development of technology and the ease with which individuals can access various information via smartphones is one of the reasons current eating behavior is heavily influenced and even driven by exposure to advertising.

Not only that, research results found that the risk of smartphone addiction plays a role in reducing mindful eating and can also be related to the emotional response dimension. This research found that the risk of smartphone addiction could be the reason teenagers consume food because of negative emotional impulses. In other words, the risk of smartphone addiction has an impact on the emergence of emotional overeating behavior (Etuk et al., 2022). This is inversely proportional to the meaning of mindful eating, where when teenagers apply mindful eating, the purpose of teenagers' eating is to fulfill their hunger needs, not to fulfill the negative emotions they feel (Framson et al., 2009). The connection with smartphone addiction is that teenagers who are at risk of smartphone addiction have difficulty controlling emotions, especially negative emotions that arise as a result of smartphone use (Mohta & Halder, 2021). Negative emotions arise, such as anger and sadness. These emotions are caused by unpleasant things such as defeat or disappointment when using a smartphone (Caner & Evgin, 2021). This negative emotion can trigger emotional eating as an emotional response to the situation. Chang's (2021) research results prove that teenagers who play online games on smartphones and experience defeat tend to generate negative emotions such as anger, frustration, disappointment, and sadness. The emergence of negative emotions makes eating a form of compensation and a form of decreased awareness that emotional factors drive the eating behavior carried out.

In the process, this research still has shortcomings. This can be a consideration for further research. Some of these shortcomings include research related to the role of the risk of smartphone addiction on bed procrastination, which was only able to prove its role at 6.1%. The remaining 93.9% is due to unmeasured factors such as self-regulation and low knowledge and awareness of the importance of sleep and fulfilling sufficient sleep time (Kadzikowska-Wrzosek, 2020). Then another weakness of this research is that the distribution of data between men and women is not balanced. In contrast, the number of teenagers in Indonesia is quite large, so the data distributed to men and women should be equal. This happened because the teenagers who acted as participants only came from the area where the researcher lived, and there were no regular checks regarding the data distribution. Then, in the demographic data section, the researchers did not ask questions to ensure that the participants involved in this study used smartphones before sleeping and while eating. Apart from that, this research has not revealed other factors considered to play a role in sleep procrastination and mindful eating, such as internal factors, external factors, situations, and social-environmental factors. Not only that, but the sample obtained in this study was 192. It is still challenging to generalize considering an extensive location, so future research should examine only specific locations and use other sampling techniques. Furthermore, future research is expected to pay attention to the distribution of participant data and look at other factors that are considered to play a role in procrastination behavior during sleep and mindful eating.

## CONCLUSION

The results of this research help understand the lifestyle of modern teenagers today. The results of the study answer the research objectives and prove that changes in adolescent lifestyles in sleep patterns and eating patterns are significantly influenced by smartphone addiction risk behavior. Smartphone addiction risk behavior plays a role in increasing procrastination behavior at



bedtime, as well as decreasing mindful eating behavior in adolescents. Previous findings support these results that teenagers desire to use smartphones all the time, even at times that should not require smartphone use, such as when going to bed and eating. Excessive smartphone use behavior supports the emergence of increased procrastination during sleep and reduces mindful eating behavior. The findings in this study contribute to helping understand teenagers' lifestyles due to excessive use of smartphones by looking at the impacts related to healthy behavior. The research findings can also be helpful as information for psychologists and counselors about smartphone addiction by considering factors related to procrastination behavior at bedtime and mindful eating, especially in adolescents.

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